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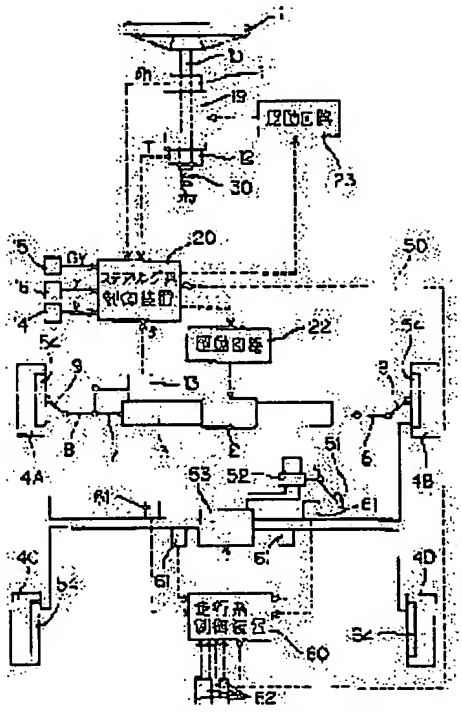
(54) STEERING DEVICE FOR VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a steering device for vehicle allowing the stabilization of a vehicle attitude in braking on μ split road.

SOLUTION: A steering system control device 20 performs the attitude control for stabilization of vehicle behavior by controlling steering mechanisms 2 and 3. A traveling system control device 60 performs the attitude control for stabilization of vehicle behavior by controlling braking mechanisms 53 and 54. When the braking mechanisms 53 and 54 are operated, it is detected which of left and right front wheels 4A and 4B has a larger wheel speed and whether the difference in wheel speed exceeds a threshold or not. When the difference in wheel speed exceeds the threshold, the braking on μ split road is judged, and the steering mechanisms 2 and 3 are controlled so as to add a control steering angle to the one having the smaller wheel speed.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] A braking operation detection means to be a power steering system for vehicles for carrying out drive control of the steering engine style of vehicles, and to detect the operation of the brake mechanism of vehicles, A speed comparison means to distinguish any of the wheel speed of the right-and-left wheel of vehicles are large, A speed judging means to judge whether the speed difference of the wheel of right and left of vehicles is over the predetermined threshold, It answers that the above-mentioned braking operation detection means detected the operation of a brake mechanism. On condition that it has judged with the speed difference of a wheel on either side being over the above-mentioned predetermined threshold, the above-mentioned speed judging means The power steering system for vehicles characterized by including the guide control means which control the above-mentioned steering engine style to add a control rudder angle in the direction of a wheel with a small speed among the wheels of the above-mentioned right and left based on the distinction result by the above-mentioned speed comparison means.
[Claim 2] The above-mentioned steering engine style is a power steering system for vehicles according to claim 1 characterized by being what controls the above-mentioned steering engine style to add a control rudder angle in the direction of a wheel with a small speed among the wheels of the above-mentioned right and left on condition that the above-mentioned speed difference after fixed time progress is over a threshold after the operation of the above-mentioned brake mechanism is detected.
[Claim 3] The power steering system for vehicles according to claim 1 or 2 characterized by the above-mentioned control rudder angle being constant value.
[Claim 4] The power steering system for vehicles according to claim 1 or 2 characterized by including further the means which carries out an adjustable setup according to the difference of the braking situation of the wheel of the above-mentioned right and left of the above-mentioned control rudder angle.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the power steering system for vehicles which can perform attitude control of vehicles by control of a steering engine style.
[0002]
[Description of the Prior Art] While losing the mechanical combination with the steering engine style for ****(ing) a steering wheel and a guide wheel and detecting the operation direction and control input of a steering wheel, based on the detection result, the power steering system for vehicles (steer motorcycle wire system) which gave the driving force from actuators, such as an electrical motor, to the steering engine style is proposed (for example, refer to JP,9-142330,A).
[0003] since it is not necessary to connect a steering engine style and a steering wheel mechanically by adopting such composition, while being able to prevent the pressure from below of the steering wheel at the time of a collision -- the composition of a steering engine style -- simplification -- and it can lightweight-ize Moreover, the flexibility of the arrangement position of a steering wheel can also enable increase and adoption to the operating member of others further, such as levers other than a steering wheel, or a pedal.
[0004] In the power steering system for vehicles of the above composition, since the relation between operation of a steering wheel and operation of a steering engine style can be freely changed by electric control, it is expected that the performance of vehicles can be improved by leaps and bounds. For example, by asking for the target yaw rate or target lateral acceleration corresponding to the operation torque or the operation angle of a steering wheel, and controlling operation of a steering engine style based on these, attitude control of vehicles can be performed and the movement property of vehicles over steering can be optimized.
[0005]
[Problem(s) to be Solved by the Invention] When the above steer Bayh wire systems perform attitude control of vehicles, while detecting the real yaw rate of vehicles, the target yaw rate according to operation of a steering wheel is defined. And ****** of a steering engine style is defined so that a real yaw rate may be brought close to a target yaw rate. More specifically, target ****** is called for based on the deflection of a real yaw rate and a target yaw rate, and a steering engine style is controlled to make actual ****** of a steering engine style in agreement with this target ******.
[0006] However, if a steering actuator is always controlled based on the deflection of a target yaw rate and a real yaw rate, it turns out that it will be in a superfluous control state, and the problem that rolling occurs especially at the time of a low-speed run arises even if it is at the normal rectilinear-propagation run time. In order to cope with this problem, it is possible to set up certain threshold conditions and to dull control of a steering actuator. That is, attitude control by control of a steering actuator is not performed until the deflection of a target yaw rate and a real yaw rate reaches a fixed threshold for example.
[0007] However, if such composition is adopted, since delay will arise in control, by the so-called mu split on the street, disorder of a vehicles posture cannot be suppressed effectively, for example. The case where mu split way means the road surface from which the right-hand side of vehicles and left-hand side differ in coefficient of friction of a road surface remarkably, for example, a right-hand side wheel is in a dry asphalt on the street, and a left-hand side wheel is on a surface of ice is an example of a type. If the brake mechanism of vehicles is operated in such mu split on the street, big damping force occurs in Quantity mu (high coefficient of friction) side, and the big yaw moment accompanying this will arise promptly, and will produce disorder into a vehicles posture. Therefore, it is desirable to perform the so-called counter steering control, to give the control yaw moment of an opposite direction to vehicles, and to attain stabilization of a vehicles posture.

[0008] However, with the above-mentioned composition which delay produces in control, since the yaw moment in early stages of braking cannot be suppressed, it does not escape that big disorder arises into the posture of vehicles. The cause of the delay of control has the delay by the operation of a target yaw rate, the delay resulting from the responsibility of a steering actuator, etc. in others, and becomes about 120 ms -130 mses on the whole. Such control delay cannot be disregarded at the time of braking mu split on the street.

[0009] Then, the purpose of this invention is offering the power steering system for vehicles which can solve an above-mentioned technical technical problem and can be contributed to stabilization of the vehicles posture at the time of braking.

[0010]

[A The means for solving a technical problem and an effect of the invention] Invention according to claim 1 for attaining the above-mentioned purpose A braking operation detection means to be a power steering system for vehicles for carrying out drive control of the steering engine style (2 3) of vehicles, and to detect the operation of the brake mechanism (53 54) of vehicles (60, 50, S1), A speed comparison means to distinguish any of the wheel speed of the right-and-left wheel of vehicles are large (60, 50, S3), A speed judging means to judge whether the speed difference of the wheel of right and left of vehicles is over the predetermined threshold (60, 50, S2), It answers that the above-mentioned braking operation detection means detected the operation of a brake mechanism. On condition that it has judged with the speed difference of a wheel on either side being over the above-mentioned predetermined threshold, the above-mentioned speed judging means It is the power steering system for vehicles characterized by including the guide control means (20 S4, S5) which control the above-mentioned steering engine style to add a control rudder angle in the direction of a wheel with a small speed among the wheels of the above-mentioned right and left based on the distinction result by the above-mentioned speed comparison means. The alphabetic character in a parenthesis expresses the correspondence component in the below-mentioned operation form etc. In the following and this term, it is the same.

[0011] When according to this invention a brake mechanism operates and damping force is given to vehicles, it is judged whether the difference (speed difference) of the wheel speed of a wheel on either side is over the predetermined threshold. Possibility that coefficient of friction of the road surface which vehicles are running differs greatly by right and left of vehicles at the time of braking when the speed difference of a wheel on either side is large is high. Then, in such a case, a steering engine style is controlled so that wheel speed adds a control rudder angle in the direction of the wheel of the smaller one. The control yaw moment which negates the yaw moment which originates in a difference of road surface coefficient of friction in right and left of vehicles, and is committed on vehicles by this is given to vehicles.

[0012] Thus, in this invention, prompt control of a steering engine style is performed based on whether the speed difference of a right-and-left wheel is over the threshold at the time of the operation of a brake mechanism. Thereby, when braking operation is performed while running the so-called mu split road surface top, the attitude control for negating the yaw moment which originates in this braking and is committed on vehicles can be made to perform by good responsibility. Invention according to claim 2 is a power steering system for vehicles according to claim 1 characterized by being what controls the above-mentioned steering engine style so that the above-mentioned steering engine style adds a control rudder angle in the direction of a wheel with a small speed among the wheels of the above-mentioned right and left on condition of the above-mentioned speed difference after fixed time progress being over a threshold, after the operation of the above-mentioned brake mechanism is detected.

[0013] According to this invention, a judgment whether a control rudder angle is added based on the speed difference after progress is made during a back fixed period when the operation of a brake mechanism was detected. Thereby, control can prevent a bird clapper superfluously and can prevent the malfunction at the time of the usual braking. As for the above-mentioned fixed time, it is desirable to consider as the minute time of about 40-70 mses so that big disorder may not arise into the posture of vehicles. What is necessary is just to consider as the about [4 period -5 periods] time of this control period, when guide control means repeat control of a steering engine style to every fixed control period (10 mses) and specifically perform it to it.

[0014] Invention according to claim 3 is a power steering system for vehicles according to claim 1 or 2 characterized by the above-mentioned control rudder angle being constant value. In this invention, since the control rudder angle added to the rudder angle of a steering engine style is made into constant value when the speed difference of a wheel on either side is over the threshold, the control action of guide control means becomes easy. Since a steering engine style is promptly controllable according to it, the yaw moment produced in early stages of braking of vehicles can be suppressed effectively.

[0015] Invention according to claim 4 is a power steering system for vehicles according to claim 1 or 2 characterized by including further the means which carries out an adjustable setup according to the difference of the braking situation

of the wheel of the above-mentioned right and left of the above-mentioned control rudder angle. According to this invention, since an adjustable setup of the above-mentioned control rudder angle is carried out according to the difference of the braking situation of a wheel on either side, the suitable control yaw moment according to the size of the difference of coefficient of friction of the road surface which a wheel on either side touches, respectively etc. can be given to vehicles by control of a steering engine style. Thereby, more suitable attitude control can be performed at the time of braking.

[0016] The power steering system for vehicles of this invention may collaborate with the braking control means (60) for controlling a brake mechanism. In this case, you may make it detect the operation of a brake mechanism, and the wheel speed of right and left of vehicles in braking control means. Furthermore, in braking control means, you may suppose the speed of a right-and-left wheel that size comparison is carried out, and may be made to perform size comparison with the speed difference of a right-and-left wheel, and a threshold further.

[0017] In this case, what is necessary is just to connect guide control means and braking control means through the suitable communication line (50). That is, guide control means have which large wheel speed of a right-and-left wheel in whether the brake mechanism operated, or should just acquire the data which mean, respectively whether the speed difference of a right-and-left wheel is over the threshold from braking control means through a communication line. As for the above-mentioned steering engine style, it is desirable to be constituted so that there may be no mechanical combination with operating member for steering (1), such as a steering wheel, and a steering engine style or such a mechanical combination can be canceled if needed. With such composition, it is easy to attain stabilization of vehicles behavior by steering control for which steering control according to the intention of an operator can be performed, and it does not depend on operation of the operating member for steering by controlling a steering engine style electrically corresponding to operation of the operating member for steering.

[0018]

[Embodiments of the Invention] Below, the form of implementation of this invention is explained in detail with reference to an accompanying drawing. Drawing 1 is a conceptual diagram for explaining the fundamental composition of the power steering system for vehicles concerning 1 operation form of this invention. This power steering system for vehicles has attained steering, without connecting mechanically a steering wheel 1 and the steer ring gear 3 by changing into **** movement of the front part right-and-left wheels 4A and 4B (guide wheel) operation of the actuator 2 for steering driven according to rotation operation of a steering wheel (operating member for steering) 1 by the steer ring gear 3. In this case, the steering engine style is constituted by the actuator 2 for steering, the steer ring gear 3, etc.

[0019] Electrical motors, such as a well-known brushless motor, can constitute the actuator 2 for steering, for example. The steer ring gear 3 has movement DBMS (ball-thread mechanism etc.) which changes rotation of the output shaft of the actuator 2 for steering into the rectilinear motion of the shaft orientations (cross direction) of the steering rod 7. Movement of the steering rod 7 is transmitted to a steering knuckle arm 9 through a tie rod 8, and causes rotation of this steering knuckle arm 9. Thereby, **** of the wheels 4A and 4B supported by the steering knuckle arm 9 is attained.

[0020] The steering wheel 1 is connected with the rotation shaft 10 supported possible [rotation] to the body. The reaction force actuator 19 for giving steering reaction force to a steering wheel 1 is attached to this rotation shaft 10. Specifically, electrical motors, such as a brushless motor which has the rotation shaft 10 and the output shaft of one, can constitute the reaction force actuator 19. The elastic member 30 which consists of a swirl spring etc. is combined with the edge of an opposite side between the bodies in the steering wheel 1 of the rotation shaft 10. This elastic member 30 returns a steering wheel 1 to a rectilinear-propagation steering position by the elastic force, when the reaction force actuator 19 has not added torque to a steering wheel 1.

[0021] In order to detect the operation input value of a steering wheel 1, the angle sensor 11 for detecting operation angle deltah corresponding to the angle of rotation of the rotation shaft 10 is formed. Moreover, the torque sensor 12 for detecting the operation torque T added to the steering wheel 1 is formed in the rotation shaft 10. On the other hand, the ****** sensor 13 which detects ****** delta of Wheels 4A and 4B is formed as an output-value sensor for detecting the output value of the actuator 2 for steering. This ****** sensor 13 can consist of potentiometers which detect the amount of operations of the steering rod 7 by the actuator 2 for steering.

[0022] The angle sensor 11, the torque sensor 12, and the ****** sensor 13 are connected to the steering system control unit 20 (guide control means) containing a computer (ECU : electronic control unit). The steering system control unit 20 controls the actuator 2 for steering, and the reaction force actuator 19 through the drive circuits 22 and 23. The lateral acceleration sensor 15 for detecting the lateral acceleration Gy of vehicles, the yaw rate sensor 16 which detects the yaw rate gamma of vehicles, and the speed sensor 14 which detects the vehicle speed V are further connected to the steering system control unit 20.

[0023] On the other hand, the steering system control unit 20 communicates with the run system control unit 60

(braking control means) for controlling braking of vehicles through a line 50, and delivers and receives data. And the data showing the lateral acceleration Gy detected by the lateral acceleration sensor 15, the yaw rate sensor 16, and the speed sensor 14, the yaw rate gamma, and the vehicle speed V are transmitted also to the run system control unit 60 through a line 50 while they are used within the steering system control unit 20.

[0024] The braking pressure according to the treading strength of a brake pedal 51 is generated by the master cylinder 52, while this braking pressure is amplified by the braking pressure control unit 53, it is distributed to each brake gear 54 of front wheels 4A and 4B and rear wheels 4C and 4D, and each brake gear 54 makes damping force act on each wheels 4A-4D. And the braking pressure of each wheels 4A-4D is individually controlled by controlling the braking pressure control unit 53 by the run system control unit 60 constituted by computer (ECU).

[0025] The damping force sensor 61 which detects individually the damping force of each wheels 4A-4D other than the steering system control unit 20, and the wheel speed sensor 62 which detects individually each rotational speed of each wheels 4A-4D are connected to the run system control unit 60. The run system control unit 60 controls the braking pressure control unit 53 to be able to distribute according to the rotational speed of each wheels 4A-4D detected by the wheel speed sensor 62, and the feedback value by the damping force sensor 61, while amplifying braking pressure. Thereby, it is supposed that it is possible to control individually the damping force of each wheels 4A-4D. In addition, even when operation of a brake pedal 51 is not made, the braking pressure control unit 53 is constituted so that braking pressure can be generated with a built-in pump.

[0026] The steering system control unit 20 and the run system control unit 60 perform attitude control for stabilization of vehicles behavior, respectively. That is, the steering system control unit 20 attains stabilization of vehicles behavior by controlling the actuator 2 for steering. Specifically, based on operation angle deltah of a steering wheel 1, target yaw rate gamma* calculates and the direction of front wheels 4A and 4B is controlled that the real yaw rate gamma of the vehicles detected by the yaw rate sensor 16 should be completed as target yaw rate gamma* (yaw rate control).

[0027] On the other hand, by controlling the size of the braking pressure in the wheel by the side of the inner direction of the TR of vehicles, or the method of outside, the run system control unit 60 completes the real yaw rate gamma of vehicles as target yaw rate gamma*, and realizes attitude control of vehicles. The steering system control unit 20 usually calculates target yaw rate gamma* based on operation angle deltah of a steering wheel 1, and the operation torque T at the time of a run. Deflection with the real yaw rate gamma detected by this target yaw rate gamma* and the yaw rate sensor 16 calculates, and target ****** delta* which is the desired value of ****** of the pre-right-and-left rings 4A and 4B is called for based on this deflection. The steering actuator 2 drives according to deflection with real ****** delta detected by this target ****** delta* and the ****** sensor 13. In this way, **** according to operation of a steering wheel 1 is attained.

[0028] If the steering actuator 2 is always controlled based on the deflection of a yaw rate, also in the time of a normal rectilinear-propagation run, intense rolling will occur on vehicles especially in a low-speed run region. That is, the steering actuator 2 will be in a superfluous control state. In order to prevent this superfluous control state, the control condition shown in following the (1) formula is set up. That is, on condition that this control condition is fulfilled, attitude control based on the deflection of a yaw rate is performed.

[0029]

Beta/C1+beta'/C2> 1 And ****'> 0 ..... The angle-of-sideslip speed (beta'=d beta/dt) of vehicles, and C1 and C2 is [(1) beta of the angle of sideslip of vehicles and beta'] constants (for example, C1=1 degree, C2=5 degree/second). Since **** control for attitude control is performed by this only when it is the situation which angle-of-sideslip beta emits, it can prevent that rolling arises on vehicles.

[0030] in the above-mentioned Prior art, such control is applied also at the time of braking, therefore trouble was especially caused to stabilization of the vehicles posture at the time of braking mu split on the street That is, the time delay of control arises by imposing the above control conditions on the attitude control by control of a steering engine style. For this control time delay, the yaw rate produced on vehicles in early stages of braking mu split on the street will not be able to be suppressed, but a vehicles posture will be confused. Therefore, for stabilization of a vehicles posture, an operator has to perform suitable steering operation.

[0031] In order to solve this problem, in this operation gestalt, the steering system control unit 20 controls a steering engine style based on the braking situation data given from the run system control unit 60, when braking mu split on the street is detected. That is, the steering system control unit 20 acquires braking situation data from the run system control unit 60 through the communication line 50. The speed comparison data WHv showing whether which wheel speed of the stop-lamp signal data STP and the pre-right-and-left rings 4A and 4B is large and the judgment result data Wth of whether the degree difference of wheel speed of the pre-right-and-left rings 4A and 4B is over the predetermined threshold (for example, 1.5 - 2.0 km/h) are contained in this braking situation data.

[0032] The run system control unit 60 calculates pre-right-and-left ring 4A and 4B speed difference based on the wheel

speed data of four wheels 4A-4B inputted from the wheel speed sensor 62. And based on this calculated speed difference, size comparison of this is carried out with a fixed threshold, and it sends out to the communication line 50 by using the comparison result as the judgment result data Wth. Moreover, the speed comparison data WHv showing whether which wheel speed of the pre-right-and-left rings 4A and 4B is large are created, and it sends out to the communication line 50. The stop-lamp signal STP is data showing whether the stop lamp of vehicles is on, and is equivalent to the brake-mechanism operation situation data showing whether the brake mechanism is operating.

[0033] The stop-lamp signal data STP, the speed comparison data WHv, and the judgment result data Wth can be expressed by 1-bit data, respectively. The steering system control unit 20 and the run system control unit 60 are delivering and receiving data for example, per 1 byte (8 bits). Therefore, above-mentioned braking situation data can deliver and receive the communication line 50 using the triplet in 1 byte of data which mind and are carried out.

[0034] Drawing 2 is an illustration view for explaining the situation of braking mu split on the street [so-called]. mu split road surface 70 is the quantity mu way [like the road surface of dry asphalt toward the travelling direction 85 of vehicles 80] 71 whose right-hand side is, and is the low mu way [like a surface of ice toward the travelling direction 85 of vehicles 80] 72 whose left-hand side road surface is. The right-hand side wheels 4B and 4D of vehicles 80 are on the quantity mu road surface 71, and in the state where the left-hand side wheels 4A and 4C are on the low mu way 72, if a brake pedal 51 is broken in, the yaw moment of arrow 81 direction will arise on vehicles 80. The steering system control unit 20 and the run system control unit 60 perform attitude control operation, respectively to negate the yaw moment of this arrow 81 direction.

[0035] If a steering wheel 1 is intentionally held as much as possible in a center valve position during the braking, in the guide attitude control from the former, vehicles 80 will draw curvilinear tracing in alignment with the line 83 for the delay of control. In order to prevent this, an operator is going to turn vehicles 80 to travelling direction 85, is going to operate a steering wheel 1 violently utterly, and is going to make it run vehicles 80 by tracing which is shown by the reference mark 82 and which meets a straight line mostly. Drawing 3 is a flow chart for explaining operation of the steering system control unit 20. The steering system control unit 20 judges whether the brake mechanism is operating by referring to the stop-lamp signal data STP (Step S1). If the brake mechanism is operating, with reference to the judgment result data Wth, it will judge further whether the speed difference of the right-and-left front wheels 4A and 4B is over the threshold (Step S2). if this judgment is affirmed -- the steering system control unit 20 -- further -- the speed comparison data WHv -- referring to -- the inside of front wheels 4A and 4B -- right and left -- it distinguishes whether the wheel speed of which wheel is small (Step S3) When the wheel speed of right-hand side front-wheel 4B is smaller, the control rudder angle corresponding to **** of the fixed rudder angle (for example, about 2 times) to the right is added to target ****** delta* (step S4). On the other hand, when the wheel speed of left-hand side front-wheel 4A is smaller, the control rudder angle corresponding to **** of the fixed rudder angle (for example, about 2 times) to the left is added to target ****** delta* (Step S5). The control yaw moment which wheel speed rotates to the smaller one will be given to vehicles by this.

[0036] Drawing 4 is a graph which shows change of the wheel speed at the time of braking mu split on the street. The wheel speed change according to the time progress from the braking start of the pre-right-and-left rings 4A and 4B is shown in this drawing 4 . The wheel speed of right-hand side front-wheel 4B on the quantity mu road surface 71 does not fall rapidly immediately after applying braking pressure. On the other hand, since left-hand side front-wheel 4A on the low mu road surface 72 slips easily, if braking pressure is applied, the wheel speed will fall rapidly. At this time, the yaw moment will arise in the arrow 81 direction in drawing 2 .

[0037] On the other hand, the steering system control unit 20 adds a control rudder angle to target ****** delta* so that wheel speed may give the control yaw moment of the smaller one, i.e., left-hand side, to vehicles 80. Thereby, since the so-called counter steering control will be performed in addition to operation of a steering wheel 1, a vehicles posture is stabilized. Therefore, vehicles 80 can be stopped, holding [making it run vehicles 80 along with the linear tracing 82 (to refer to drawing 2), even if an operator did not operate a steering wheel 1 violently, and] a vehicles posture stably.

[0038] Above-mentioned attitude control based on the braking situation data from the run system control unit 60 is promptly performed by whether the control condition shown in the ****** (1) formula is fulfilled not related. With this operation gestalt, ECU (electronic control unit) which constitutes the steering system control unit 20 is the control period made into a for example, 10 mses round-term, and is repeating and performing the operation for control of the steering actuator 2. If the steering system control unit 20 is judged that the brake mechanism operated based on the stop-lamp signal data STP, on condition that the judgment result data Wth are the value the speed difference of the right-and-left front wheels 4A and 4B indicates it to be that it is over a threshold, it will add the fixed control rudder angle for **** to the direction where wheel speed is small, for example after 4 control periods or 5 control periods at target ****** delta*. Thus, by only fixed minute time (40 - 50 ms) being overdue from the operation of a brake

mechanism, and adding a control rudder angle to target ****** delta*, it can avoid carrying out a malfunction at the time of normal braking, and superfluous control is not performed during the braking. And between the minute time about 4 - 5 control period, big swinging does not arise on vehicles 80. Therefore, according to control of this operation gestalt, the yaw moment produced on vehicles 80 can be suppressed by good responsibility.

[0039] The time delay of the steering control based on braking situation data is equal to the minute time (40 - 50 ms) of the above-mentioned regularity, and is remarkably shortened as compared with the control time delay (120 - 130 ms) by the conventional technology. thereby, the responsibility of the attitude control by control of the steering engine style at the time of braking is markedly alike, and improves Drawing 5 is a graph which shows the experimental result by this artificer. Drawing 5 (a) shows time change of the yaw rate gamma of vehicles 80, drawing 5 (b) shows time change of operation angle deltah of a steering wheel 1, and drawing 5 (c) shows time change of ****** delta detected by the ****** sensor 13. This drawing 5 (a) It is collectively shown to - (c) by the test data about the conventional technology.

[0040] From drawing 5 (a), it is understood by adopting control of this operation gestalt that the yaw rate gamma of vehicles 80 can be stabilized extremely. moreover, it is understood that the operation added to a steering wheel 1 in order to hold vehicles 80 in the rectilinear-propagation state is markedly alike, and decreases from drawing 5 (b) This means that the posture of vehicles 80 can be stabilized, without being based on an operator's skill at the time of sudden braking operation mu split on the street. Furthermore, from drawing 5 (c), it is understood that the responsibility of the ****** change in the early stages of braking is improved remarkably.

[0041] As mentioned above, while the brake mechanism is operating, when the difference of the wheel speed of the right-and-left front wheels 4A and 4B is over the fixed threshold according to this operation gestalt, it is considered that braking mu split on the street is performed. And it is made to suppress the yaw moment produced on vehicles 80 in early stages of braking by good responsibility by adding a fixed control rudder angle to the smaller one of wheel speed at the time of braking on mu split. By this, even when sudden braking operation is performed on mu split road surface, where the posture of vehicles 80 is held stably, good braking operation can be attained.

[0042] As mentioned above, although 1 operation gestalt of this invention was explained, this invention can also be carried out with other gestalten. For example, with the above-mentioned operation gestalt, when attitude control based on braking situation data is performed, the fixed control rudder angle supposes that it is added to the smaller one which is the degree of wheel speed. However, the control rudder angle added to target ****** delta* in the case of the attitude control based on braking situation data does not need to be fixed. For example, according to the size of the speed difference of the right-and-left front wheels 4A and 4B, you may carry out an adjustable setup of the control rudder angle. Moreover, according to the size of the difference of damping force which works for the right-and-left front wheels 4A and 4B, or the size of the difference of braking pressure, you may be made to carry out an adjustable setup of the control rudder angle. In addition, if there is suitable physical quantity which changes corresponding to the difference of damping force on either side, according to such physical quantity, an adjustable setup of the control rudder angle can also be carried out.

[0043] Moreover, with the above-mentioned operation gestalt, it is supposed that the stop-lamp signal data STP, the speed comparison data WHv, and the judgment result data Wth will be given to the steering system control unit 20 from the run system control unit 60 through the communication line 50. However, for example, the stop-lamp signal data STP and the wheel speed data of the front wheels 4A and 4B on either side may be made to be given to the steering system control unit 20 from the run system control unit 60 through the communication line 50. In this case, in the steering system control unit 20, it will be judged whether size comparison and those speed difference of the wheel speed of the right-and-left front wheels 4A and 4B are over the fixed threshold.

[0044] Moreover, although the above-mentioned operation gestalt explained the example with which the attitude control by control of a steering engine style and the attitude control by control of a brake mechanism are used together, the run system control unit 60 does not necessarily need to perform attitude control by control of a brake mechanism. That is, this invention can be applied when attitude control of vehicles 80 is chiefly performed by control of a steering engine style. Of course, it is not necessary to consider as the composition which acquires the data about wheel speed from the run system control unit 60 through the communication line 50, and you may make it take in the output signal of the wheel speed sensor 62 directly to the steering system control unit 20.

[0045] Moreover, although the so-called steer Bayh wire system by which the steering engine style and the steering wheel 1 are not combined mechanically was taken for the example with the above-mentioned operation gestalt, a steering wheel 1 and a steering engine style can apply this invention also to the power steering system for vehicles connected mechanically. For example, attitude control of vehicles can be performed by controlling ****** of a steering wheel using the power-steering equipment for giving the steering auxiliary force to a steering engine style. Moreover, a clutch is infixed between a steering wheel 1 and a steering engine style, and the composition of which it

can connect mechanically or this connection can be canceled if needed may be adopted in a steering wheel 1 and a steering engine style.

[0046] In addition, it is possible to perform design changes various in the range of the technical matter indicated by the claim.

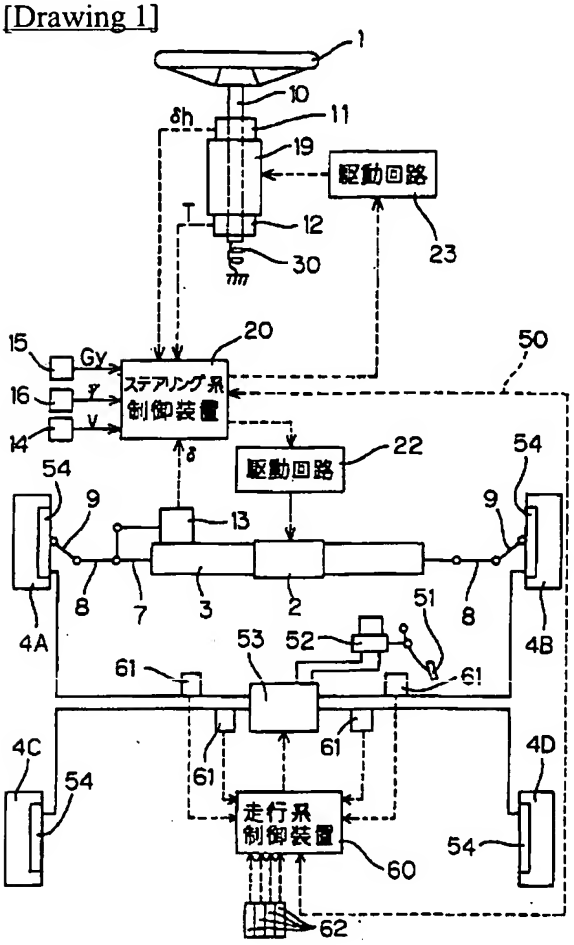
[Translation done.]

* NOTICES *

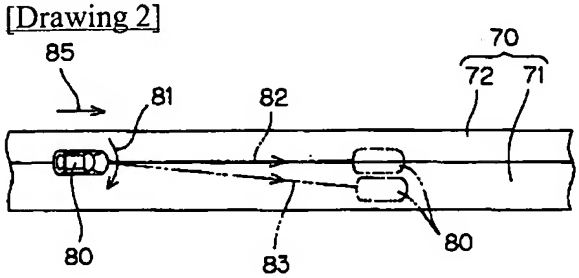
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

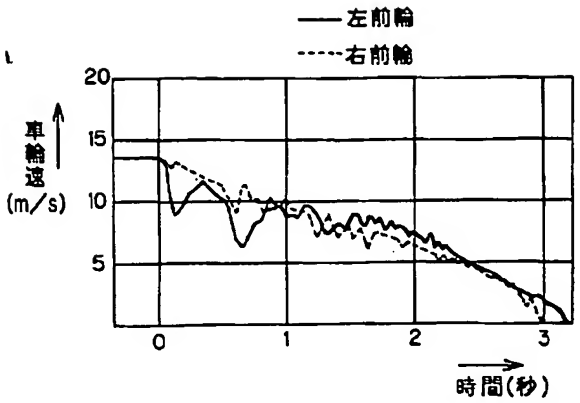
[Drawing 1]



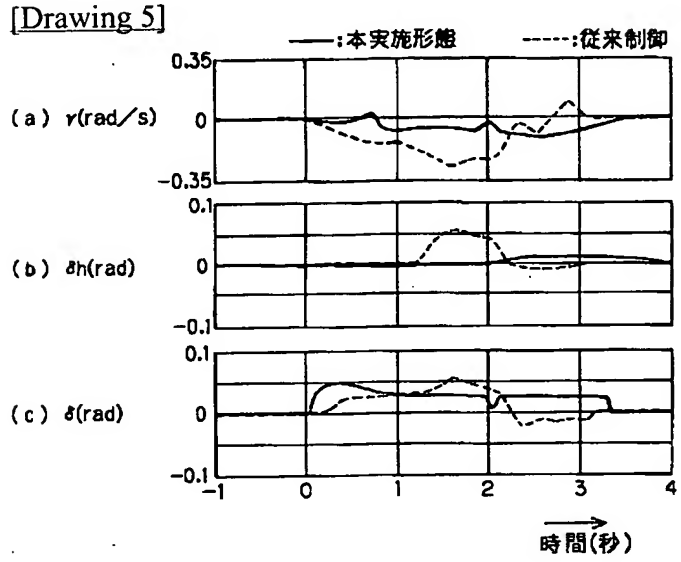
[Drawing 2]



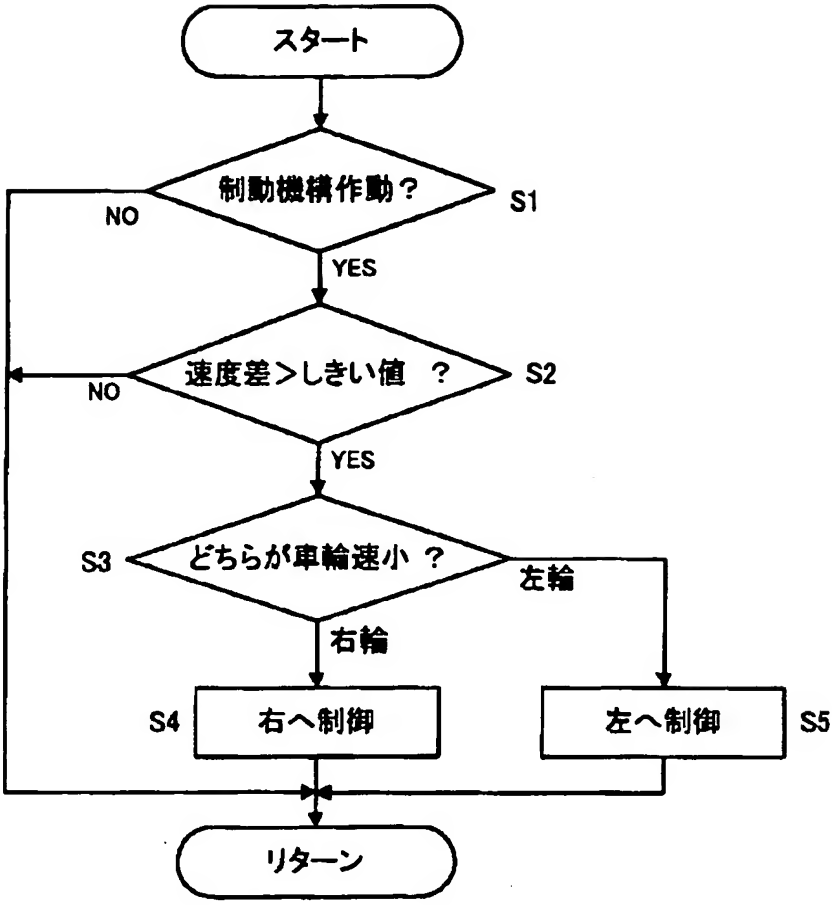
[Drawing 4]



[Drawing 5]



[Drawing 3]



[Translation done.]